CHAPTER 14

TECHNICAL ADMINISTRATION AND SUPERVISION

The higher you ascend on the enlisted rating ladder, the more valuable you become to the Navy. This is understandable since you have more experience in your rating, have probably attended several Navy schools, and your attitudes are well-oriented to Navy life. In a sense, you are now in a position and better qualified to impart your knowledge and experience to the personnel serving under you. Your bearing, actions, and disposition will be under scrutiny not only by your seniors but also by your subordinates.

As a supervising EA1, your job is a many-sided task. It involves the procurement of necessary equipment, repair parts, and other materials; planning, scheduling, and directing work assignments; maintaining an adequate file of appropriate publications; interpreting and complying with current directives; collecting engineering data; making progress reports; carrying on a comprehensive and effective training program; interviewing subordinates, using the *Personnel Readiness Capability Program (PRCP)* guidelines; and drafting official correspondence.

This chapter discusses many of the duties and responsibilities of the EA1 supervisor. These discussions center on those topics that, for the most part, are considered to be unique to the Engineering Aid rating; in other words, those administrative and supervisory topics related specifically to supervising the engineering division and assisting the management division of the operations department in a Naval Mobile Construction Battalion.

Obviously, there are many other subjects that relate to the Navy or the Seabees, in general, that you must also be thoroughly familiar with to be an effective supervisor. Those topics, such as leadership principles, principles of administration, correspondence procedures, and so forth, can be found in the Navy's military requirements books that are required study for advancement in rating. General topics related to the Seabees as a whole, such as the *PRCP* program, are covered in the *NCF/Seabee PO1* training manual (TRAMAN). Some other topics that you should become familiar with, such as facilities maintenance management, project site approval requirements, and special project and military construction (MILCON) project submittal procedures, are also not discussed in this TRAMAN; however, a listing of reference sources concerning these and other topics is contained in appendix IV of this TRAMAN.

By now, you should be very familiar with the organization of a Seabee construction battalion and with the battalion's operations department. Therefore, we will begin our discussion of your responsibilities by first discussing the management division and the ways in which you will be expected to assist the management division. Then we will discuss your duties and responsibilities as they relate to supervising the engineering division of the operations department.

MANAGEMENT DIVISION

The management division of the operations department may be headed by the assistant operations officer or by the operations chief, acting in an advisory capacity to the operations officer and the operations staff. This division is sometimes referred to as the administrative division of the operations department. The management division is normally staffed by the operations Yeoman and the timekeeper. Sometimes these positions are filled by EAs.

The management division collects, compiles, and analyzes all information related to the construction operations. This information is used in the preparation of construction operations reports, including the Deployment Completion Report, Monthly Situation Report, and any other special reports required by higher authority. The engineering division will be required to assist in the preparation of these reports by supplying technical information concerning construction projects. Some reports may be compiled from existing records; others may require special investigation and research.

Some examples of reports that you maybe involved with are briefly discussed below.

LABOR DISTRIBUTION REPORTS AND TIMEKEEPING

Labor reporting, such as that included in a Monthly Situation Report and a Deployment Completion Report (both of which are discussed below), is of great importance to the operation of Seabee units. It provides management with data that is necessary to determine labor expenditures on project work for calculation of statistical labor costs and to compare actual construction performance with estimating standards. It also serves to determine the effectiveness of labor utilization in performing administrative and support functions, both for internal unit management and for development of planning standards by higher command.

For labor reporting to be effective, an accurate labor accounting or timekeeping system is mandatory. This system must permit the day-by-day accumulation of labor utilization data insufficient detail and in a reamer that allows ready compilation of information required by the operations officer in the management of manpower resources and in the preparation of reports to higher authority. The timekeeping system used in Naval Construction Force units is described in COMSECOND/THIRDNCBINST 5312.1 series. For the purpose of our TRAMAN discussion, only the most important aspects of the system are covered.

In the system, the basic unit for measuring labor is the **man-hour** which, as you know, is the amount of labor produced by one person working 1 hour of time. **Man-days** are computed on the basis of an 8-hour day regardless of the length of the scheduled workday. therefore, if an individual has worked a scheduled 9 hours in 1 day, he or she has expended $9 \div 8 = 1.125$ man-days of effort. Similarly, ten persons working 9 hours in a scheduled workday is equivalent to 11.25 man-days.

All labor is considered as being either productive labor or overhead. **Productive labor** includes all labor that directly or indirectly contributes to the accomplishment of the mission, including military operations and readiness, disaster control operations, training, and, of course, construction operations. For the latter-construction operations-productive labor is further accounted for in two categories as follows:

1. **Direct labor** includes all labor expended directly on assigned construction tasks, either in the field or in the shop, and which contributes directly to the completion of the end product. For EAs, this includes, for example, surveying on a tasked construction project, travel time to and from project sites, and the preparation of as-built drawings.

2. **Indirect labor** comprises all labor required to support construction operations, but which does not produce an end product itself. This category is further subdivided under various codes listed in COMSECOND/THIRDNCBINST 5312.1 series. One of the codes, X02 - operations and engineering, lists such work as drafting (other than as-built preparation), surveying (for other than tasked projects), materials testing, and timekeeping as indirect labor.

Overhead labor is not considered to be productive labor in that it does not contribute directly or indirectly to the end product. It includes all labor that must be reported regardless of the assigned mission. Examples of overhead labor are the work performed by personnel assigned to the S-1 department, leave and liberty, and time spent getting haircuts and going to the exchange during working hours. It also includes time lost due to inclement weather and waiting for transportation.

MONTHLY SITUATION REPORT (SITREP)

Each deployed battalion submits a monthly report of its construction operations to either Commander, SECOND Naval Construction Brigade (COMSECONDNCB) or Commander, THIRD Naval Construction Brigade (COMTHIRDNCB). The recipient brigade depends upon which theater of operations the battalion is in. The report, transmitted in a naval message format, provides a review of the battalion's construction activities during the reporting period. For each project tasked to the battalion (including the main body and each detail site), the SITREP lists the scheduled and actual percentages of project completion, the remaining direct-labor man-days needed to complete the project, and the estimated usable completion date (UCD) of the project. For each tasked project, the SITREP provides also a brief comment describing the main work performed during the reporting period. Additionally, the SITREP includes a personnel summary for the main body and detail sites and a direct-labor capability analysis. The capability analysis compares the battalion's total remaining direct-labor man-day availability with the total remaining man-days needed to complete all project tasking.

For further discussion of the SITREP format and requirements, you should refer to the *NMCB Operations Officer's Handbook,* COMSECOND/THIRDNCB-INST 5200.2 series. This instruction, simply called the

Ops Officer's Handbook, also describes the manner in which planned and actual project percentages, man-days remaining, and other important project planning and management data are determined. As an EA supervisor, you should become thoroughly familiar with the *Ops Officer's Handbook.*

DEPLOYMENT COMPLETION REPORT

The Deployment Completion Report is the primary source of historical information for battalion accomplishments and lessons learned during deployment. It covers all battalion aspects for the deployment including project work, training, safety, administration, supply and logistics, and so forth. For each aspect, the report provides lessons learned, statistical data, and brief narrative discussions of matters that maybe of significance to other NCF units deploying to the deployment site.

Specific instruction for preparing a Deployment Completion Report is found in COMSECOND/ THIRDNCBINST 3121.1 series.

ENGINEERING DIVISION

The engineering division is under the direction of the engineering officer, who is normally a Civil Engineer Corps officer in his first duty assignment. The engineering officer and his staff are responsible for providing all engineering services and designs necessary for the successful conduct of the construction program.

ENGINEERING CHIEF

An EAC, when assigned to a construction battalion, normally has a wide range of duties and responsibilities. Most often he is the engineering chief. In this capacity, he works directly for the engineering officer and is responsible for the coordination and supervision of the engineering division. However, because the EAC has a wide diversity of experience and training as a Seabee chief petty officer, he is frequently assigned to other positions, such as MLO chief, training chief, quality control chief, and sometimes, officer in charge or assistant officer in charge of a Seabee detail. On some occasions, the EAC might even be assigned to the position of engineering officer. In cases such as these, the supervisory responsibilities inherent to the position of engineering chief fall upon the shoulders of the EA1. Another responsibility often assigned to the EAC (and which could, therefore, fall upon you) is managing the radiation safety program within the battalion. For this job you need to become thoroughly knowledgeable with not only the operation and safety requirements of the nuclear moisture-density meter but also with the requirements contained in NAVSUPINST 5101.11 series and other pertinent regulations and instructions dealing with the receipt, storage, handling, and transportation of radioactive materials.

DRAFTING AND REPRODUCTION SECTION

One of the sections under the engineering officer is the drafting and reproduction section. As implied by the name of this section, the personnel assigned to it perform drafting and reproduction of engineering drawings. Most drawings and specifications are furnished to the battalion; however, it is often required that the NMCB site adapt structures, prepare plans of existing structures, design alterations of existing structures, adapt standard plans for use of local nonstandard materials, design new structures, and perform other design work. All major work designed by the NMCB must be approved by the command that exercises operational control (COMSECONDNCB or COMTHIRDNCB). In nearly every case, the NMCB prepares as-built drawings of all constructions performed by the battalion.

Most of the functions listed in the preceding paragraph are performed by the EA personnel assigned to the drafting and reproduction section. They all assist in the preparation, revision, and reproduction of drawings and perform other functions assigned by the engineering officer.

Drafting Room Supervisor

Generally, an EA1 or EAC is in charge of the drafting and reproduction section. This is a job that requires a person of superior administrative and supervisory abilities. At times your work load may be piled up so high that you will never finish without working overtime. At other times you may not have enough work to go around. These extreme situations may be avoided by proper planning and work distribution. A good method is to prepare a prioritized list of all major jobs to be done and another list of minor jobs. Naturally, you should try to channel most of your manpower toward accomplishing the major jobs first. Then, during slack times, give out the minor jobs, or fill-in jobs, for accomplishment

Kit 80011 (or Kit 11) of the NMCB Table of Allowance (TOA) contains the essential drafting equipment and tools needed by a construction battalion.

One complete kit is intended to support three drafters, and there is normally a total of two kits carried in the battalion allowance. Full 100-percent accountability for the contents of each kit is essential. For this reason, each kit must be inventoried during turnover and at twice-monthly intervals throughout the deployment. The contents of the kits must also be inspected to make sure they are in a state of good repair. Any missing items or items that are damaged beyond economical and reasonable repair must be replaced. This is done using standard Navy supply procedures. Tool-kit inventory is a job that you should delegate to a responsible EA3; however, you should remember that, as the supervisor, you can still beheld accountable for the kits. You should remember, too, that the requirement for tool-kit inventory applies not only to Kit 11 but also to the surveying and soils kits.

Additional supplies and equipment are also stocked in the engineering office to supplement the kits. These supplies and equipment also should be inventoried periodically to maintain a reasonable supply level at all times. If possible, appoint one EA to serve in a collateral duty as your section supply petty officer. He will prepare requisitions for drafting supplies as needed and keep you informed of any need for equipment repair or replacement.

For the reproduction machine (usually a Blu-Ray whiteprinter), it is a good idea to have reserve spares for those parts that break down often. Most important of all, keep an ample supply of blueprint and sepia paper stored in a cool, dark space away from ammonia fumes or vapors.

Drafting Room Layout

Small crowded rooms hinder good work and make effective safety practices difficult. According to *Facility Planning Criteria for Navy and Marine Corps Shore Installations,* NAVFAC P-80, 90 square feet of floor space per person, exclusive of storage space, should be used for planning purposes. A length-to-width ratio of about 2:1 is desirable for a drafting room, because this ratio allows for the proper arrangement of drafting tables and good lighting.

An important factor to consider is the conservation of vision, since excessive light, as well as inadequate light, induces severe eyestrain. North-exposure windows are best for admitting daylight in the Northern Hemisphere. It is important that the lighting in the room be adequate in both quality and intensity; however, take care to avoid placing working areas in positions where they will be subjected to the glare of direct sunlight. Usually, excellent artificial lighting is achieved by the use of portable, adjustable lamps that can be clamped to the drawing table and moved so that the light falls in such a way as to minimize shadows and glare.

When you arrange the drafting room, try to separate work areas and storage space. Keep materials and instruments that are not in use in easily accessible cabinets and ensure that personnel do not have to walk around someone who is working to reach supplies. Keep prints where they can be reached quickly by any authorized person. If possible, have drafting equipment and reproduction equipment located in separate rooms.

Personnel Organization

The number of drafting personnel in a construction battalion is usually small; therefore, an elaborate organization following the series or the unit assembly system is not generally feasible. Instead, the parallel system is usually followed. In this system, each person is trained to do all the different job phases, and the same person carries a drawing through from start to finish. A senior person, however, may occasionally be assigned as checker and editor, and routine tasks, such as lettering, tracing, and insertion of corrections, may be assigned to junior personnel and strikers. However, to train personnel efficiently and to sustain interest and morale, you should maintain enough rotation to ensure that each person gets varied experience.

Filing System for Drawings

The filing system used for drawings should be the one you find to be most satisfactory-meaning that there are no specific rules on the subject. For a discussion of recommending filing practices, you should review chapter 16 of the EA3 TRAMAN.

An individual should be assigned daily to the task of logging in, card indexing, and filing any drawings or prints received. Tracings should be filed separately, and there should be a standing rule that tracings must never be removed from the file except with your approval as the supervising EA. About the only time removal is necessary is for reproduction purposes.

Any print issued to a constructor should be logged out by recording the date of issue and the name of the individual to whom it was issued. The purpose of this is to allow you to inform the constructors of any changes that must be made to prints used in the field.

Reproduction Room

As you know well by now, ammonia vapors are highly toxic; therefore, for any room containing ammonia-vapor reproduction equipment, ventilation is of vital importance. Check with the battalion safety

chief to see if the ventilation in your reproduction room is adequate.

In addition, the reproduction room should be kept as dust-free as possible. Air conditioning is helpful in this regard; however, it does not take the place of good housekeeping practices.

Before a new reproduction machine is operated—even before it is installed-the potential operator must study the manufacturer's handbook carefully. The instructions it contains (both for safe and efficient installation and for safe and efficient operation) must be carefully followed

As alluded to previously, light-sensitive materials must be stored in lighttight spaces. The original containers of such materials are lighttight; therefore, the materials should remain in these containers as long as possible.

Engineering Technical Library

The overall battalion technical library contains reference publications related to construction and to subjects like ordnance, communications, military planning and training, medical and dental, professional development, and supply. Of concern to you is the engineering technical library. It should be consigned to the operations department on a subcustody basis by a designated central control office. That central control office may be the plans and training department, educational services office, or the supply department.

Publications that are required in the engineering technical library, as well as the entire battalion library, are listed in Section 12 of the TOA. Some of the NAVFAC publications that must be in the engineering library are listed below.

P-272 *Definitive Drawings for Naval Shore Facilities*

P-315 *Naval Construction Force Manual*

P-349 *NAVFAC Documentation Index*

P-357 *Abstracts of Manuals, Technical and Non-technical*

P-385 *Base Development Planning for Contingency Operations*

P-405 *Seabee Planner's and Estimator Handbook*

P-437 *Facilities Planning Guide, Volume I and Volume* 2

In addition to NAVFAC publications, numerous standards and military handbooks are also required. A few of these that you must have in the engineering library are as follows:

MIL-HDBK-1006/1	*Policy and Procedures for Project Drawing and Specification Preparation*
MIL-STD-12D	*Abbreviations for Use on Drawings and in Technical-Type Publications*
MIL-STD-14A	*Architectural Symbols*
MIL-STD-17B	*Mechanical Symbols*
MTL-STD-1OOE	*Engineering Drawing Practices*
ANSI Y14.1	*Drawing Sheet Size and Format*
ANSI Y14.5M	*Dimensioning and Tolerancing*
ANSI Y32.4	*Graphic Symbols for Plumbing Fixtures for Diagrams Used in Architecture and Building Construction*
ANSI Y32.9	*Graphical Symbols for Electrical Wiring and Layout Diagrams Used in Architecture and Building Construction*
ANSI/AWS A3.O	*Standard Welding Terms and Definitions*
ANSI/AWS 2.4	*Symbols for Welding and Non-destructive Testing*

Besides the aforementioned publications, the engineering technical library contains various commercial publications of interest to the EA, such as the current edition of *Architectural Graphic Standards* by Ramsey and Sleeper.

Maintaining the engineering technical library is another important collateral-duty job that you should delegate to a responsible EA3 working the drafting room. In this capacity the EA3, as the librarian, is responsible for arranging the publications, indexing, inventorying, and checking in or out publications. He should also be tasked with packing the entire library for embarkation to overseas deployment sites.

Checking and Editing Drawings

In any drafting layout, it is important that organization, format, conformance to applicable standards, and accuracy of every detail be checked thoroughly. Techniques in checking and editing drawings are acquired through actual experience and continuous study. Mistakes are readily seen by an individual who has long experience with the subject matter under consideration and a wide range of

knowledge. Be systematic in checking and editing drawings. Review the suggested procedures described in chapter 4 of this TRAMAN; inasmuch as there are no set rules of procedure, perhaps you could develop your own system along these lines.

During the preparation of construction drawings, feel free to consult with the Builder, Steelworker, Electrician, Equipment Operator, or Utilitiesman concerning any problems that may arise. These personnel will have to construct from your drawings. By consulting with them beforehand, you may avoid designs that are not feasible. Much time and effort may be saved by simply questioning knowledgeable people in each trade involved. Working closely with the planning and estimating section is highly beneficial. Personnel in that section will know what materials are readily available and will eventually be required to make material estimates from your construction drawings. A wise drafting supervisor will have the planning and estimating section check all construction drawings before forwarding them for approval.

Training of Drafters

A detail drafter must know just about all there is to know about prescribed conventions, procedures, and practices before he can be assigned to a detail (that is, a complete drawing) job. The best way to train new personnel for detail work is to assign them to tracing, reproduction making, filing, and the like, with the additional requirement of continuous spare-time or downtime study of appropriate NAVFAC publications and military standards. That study should include MIL-HDBK-1006/1 and the publications, such as MIL-STD-100E, that are referred to in MIL-HDBK-1006/1. As you know, most drawings used in Seabee construction are prepared by professional architect-engineer firms. Those drawings are a valuable source of study for the new—and even the more experienced—drafter to "see how the professionals do it." A study of typical drawings in NAVFAC P-437, *Facilities Planning Guide,* is also helpful. Other typical drawings and drafting conventions can be found in commercial publications, such as the *Architectural Graphic Standards.*

Work Assignments and Work Schedules

One of the most important responsibilities you will have as a drafting room supervisor is that of assigning work. To be able to do this, you must understand the work you must know exactly what you are asking each person to do and how it should be accomplished, and you must know each individual's capabilities. A person may be proficient at one thing and not at another. Some individuals may be able to work well on projects that require cooperation with others; some work best alone. The varied aspects of each individual's responsibilities and character should be taken into consideration in assigning work.

By now, you have probably had some experience with most of the work done by Seabee drafters. At one time or another, you probably have had to sit down and prepare a drawing similar to the one you will be assigning to a subordinate. Or, if you have not had the experience yourself, you probably have sat beside someone who did; and if you were alert to your opportunities, you profited by his experience.

But there is more to it than that. As a supervisor, you must learn to be able to think through the job without ever actually putting anything on paper. You must be able to foresee all of the steps necessary to do the job in order (1) to get all the information needed for the job from the person requesting it and (2) to pass this information onto the person assigned the job. Suppose, for example, that the operations officer has tasked the engineering officer to take a standard manufacturer's preengineered metal building foundation design and modify it so that it will withstand wind forces of 150 miles per hour. The engineering officer has prepared sketches from his calculations and has given the sketches to you to prepare construction drawings. You should first study these sketches to make sure you fully understand them. Ask the engineering officer to clarify anything you do not understand. Add notes to the sketches to help personnel in the field construct the foundation Check dimensions to make sure they are compatible with the original manufacturer's drawings. And finally, after you have checked the sketch and made necessary changes and additions, review the sketches with the engineering officer to make certain that your changes and additions do not disagree with the original intent of his design.

The next step is the actual assignment. If the person to whom you are assigning the work is experienced, the sketches and a few guidelines will be sufficient. But, if the person is not experienced, the work will include some on-the-job training. You must describe the sketch fully, explaining the purpose of the sketch, the steps necessary for accomplishment of the work, and all pertinent details. The drafter must be encouraged to ask you questions, and you must check his work as the drawing progresses. You must find his mistakes early to prevent his having to redo the entire drawing. Mistakes that are the fault of poor supervision will greatly demoralize an inexperienced drafter.

ENGINEERING WORK REQUEST

REQUESTED BY: Engineering Officer | DATE OF REQUEST: 25 July

DESIRED COMPLETION DATE: 10 Aug. | REQUEST NO. 5-002

WORK DESCRIPTION: Camp Covington General Warehouse. Redesign of Foundation For 150 mph Winds.

WORK GUIDELINE:

1. Do Not Change Manufacturer's Original Drawings.
2. Put Plan, Sections, And Details on One Sheet.
3. Mark Manufacturer's Foundation Plan "VOID" And Make reference to New Drawing.

SKETCH: See Enclosed Sketches

APPROVED BY: Engineering Officer | PRIORITY: Hot

ASSIGNED TO: EA3 BIGGS

DATE STARTED: | DATE COMPLETED:

Figure 14-1.—Typical engineering division work request.

To help in assigning and controlling work, the drafting room supervisor must devise a work schedule. And, to keep account of requested work, he may use a work request form of his own design.

A suggested typical work request form is shown in figure 14-1. An ample supply of these request forms should be kept by the engineering officer and by you. This same work request form can be used for work performed by all of the sections within the engineering division, not just the drafting section. Properly filling out this form ensures that all information pertinent to the work assignment is obtained from the requester. Normally the requester knows what he wants but cannot explain it in writing, so the engineering chief or drafting room supervisor should fill out the work request form and make any necessary rough sketches. All pertinent information should be included to assure coordination of the job and to minimize errors in passing on information to the person assigned the work. The work request should be made out in duplicate, one copy being put into the supervisor's file of outstanding work requests and the other copy given to the person assigned to do the work.

Work requests serve as a handy reference as to what work is waiting assignment, what work is in progress, and what work has been completed. At all times, the engineering officer, who reports directly to the operations officer, will hold you, as the supervisor, accountable for work progress.

In conjunction with current work requests, a visual work schedule should be posted, and work progress should be indicated daily. A sample work schedule is shown in figure 14-2. This schedule will keep the

DRAFTING WORK SCHEDULE

As Of: 28 July -

WORK REQUEST NO.	WORK DESCRIPTION	ASSIGNED TO:	DATE STARTED	% COMPLETE	DESIRED COMPLETION DATE	REMARKS
5-002	Warehouse Foundation Design	EA3 Biggs	25 July	75	10 Aug	
5-003	Revise Camp Elect. Plan	EA2 Larkin				Awaiting Design Info From Regiment
5-007	As-Builts, BOQs	EA2 Larkin	15 July	50	5 Aug	
5-010	Landscape Design For Main Camp Entrance	EA3 Zeikwich	20 July	30	10 Aug	
5-011	Design Retaining Wall CB Det Compound	EA3 Centudo	26 July	25	8 Aug	SEE LT May for additional info.
5-012	Cover Design for Monthly Ops Report	EACN Pitts	26 July	75	6 Aug	
5-013	As-Builts, Trap/Skeet Range				15 Aug	Awaiting Assignment
5-014	C.O.'s Briefing Charts	EACN Pitts	27 July	50	29 July	PRIORITY

Figure 14-2.—Typical drafting work schedule.

engineering officer informed as to your workload and work progress. It also will aid him in deciding on priorities for rush jobs.

Do not allow your personnel to assign priorities to work. Only you, the supervisor, or the engineering officer, when rush jobs or top priority jobs are requested, should be responsible for assigning priorities.

FIELD ENGINEERING SECTION

The field engineering section performs such field engineering work as the following:

1. Reconnaissance, preliminary, topographic, and location surveys

2. Construction stakeout; line and grade

3. Regular measurement of quantities of work in place

4. As-built location of structures for preparation of as-built record drawings

5. Measurement and computation of earthwork quantities

6. Calculations for establishing line and grade

7. Plotting survey data

8. Special surveys, such as property, triangulation, hydrographic, and the determination of true azimuth

In combat, the field crews gather needed intelligence by scouting, patrolling, and manning observation posts. They are also trained as damage survey teams for emergency recovery operations.

Survey Parties

As you learned in your previous studies, a survey party is organized and designated according to the type and purpose of the proposed survey. Whatever the purpose and scope of the survey, the job must first be planned.

You know that the first step in preparing for a field party mission is to decide upon a **job plan** by determining the answers to the following questions:

1. What is the exact nature of the job?

2. What is the best way to accomplish it?

3. How many men are required?

4. What tools, materials, and equipment are required?

5. What is the tactical situation in a wartime situation?

A large construction project requires continuous survey activity; that is, the survey can seldom be done in a single operation. Often, phases of a construction survey overlap preceding phases. When two or more survey missions are being carried on at the same time, the question of where and when to use available crews must be decided. Sometimes it is best to use all the crews on one phase of the surveying work sometimes it is best to shuttle crews from one phase to another.

The type of party sent out will depend, of course, on what the party is to do. You should already be familiar with a typical party organization; however, the paragraphs below serve as a refresher.

RECONNAISSANCE PARTY.— The manning level of a reconnaissance party is a flexible one. The number of personnel needed depends upon the purpose of the reconnaissance survey, engineering data required, terrain features, and mode of transportation. We have reconnaissance surveys for triangulation stations, routes, airfields and base sites. Each of these should be treated independently when you are planning. One consideration that also will affect the composition of the party is the choice of instruments and equipment. In a difficult situation, the weight and accessories of the survey instrument and equipment should be given careful consideration.

TRANSIT PARTY.— A transit party consists of at least three persons: instrumentman, head chainman, and party chief. The instrumentman operates the transit; the head chainman measures the horizontal distances; and the party chief, directing the survey, is usually the note keeper and may also serve as rear chainman. The party chief should be at the spot where any important measurement is made so that he can verify the reading personally. He should develop the ability to estimate distances and the sizes of angles so that he may detect any large error at the moment the dimension is called off.

STADIA PARTY.— A stadia party should consist of three persons: instrumentman, note keeper, and rodman. However, two rodmen should be used if there are long distances between observed points. That way, one can proceed to a new point, while the other is holding on a point being observed. The note keeper records the data called off by the instrumentman and makes the sketches required.

PLANE-TABLE PARTY.— A plane-table party should consist of at least three persons: instrumentman (or topographer), note keeper, and rodman. Again, a second rodman may be used when there are long distances between observed points. The note keeper records the data called off by the instrumentman and

Work Assignment — Field Party # 3

START: 3 AUG. 1986

Acting Chief of Party: C. Fox, EA 2
Rodmen: N. Alcott, P. Riley (EA 3)
Chainman: S. Dye, CN

DATE	PROJECT	TYPE OF WORK	SCOPE OF ASSIGNMENT	— STATION — BEGINNING OF JOB	REMARKS
Feb. 6, 1987	Topography.	Profile Levels.	Alice Peninsula.	Intersection of Hill & By Roads to W.	Following Hill Road Course to Rice's Jetty at end of road.
Feb. 7, 1987	"	"	"	Sta. 65+96.1 ⊙ #4	Continuing previous days work.
Feb. 8, 1987	Bldg. #20 Aviation Operations.	Bldg. Layout.	Base "S" Comm. Bldg.	Approx. Airstrip Sta. 30+00	Includes staking out revetment around structure.
Feb. 9, 1987	Hill Road.	Ditch X Sections.	Railroad Bridge to NHW @ shore.	Hill Road Traverse Sta. 15+09.61	Interval stations at all changes in channel slope.

Figure 14-3.-A surveying work assignment sheet.

BENCH MARK SHEET

N. E. SEC. ACORN-6 AREA-AJAX.

BM NO.	LOCATION	ELEV.	TYPE	OTHER REF. DATA
A-17	100' N & 50' W of N.W. Cor. of Station Dispensary inside of fence corner. Bronze disk in concrete monument.	102.723	P.B.M.	U.S.C. & G.S. 1st Order
A-21	Spike in 24" tree root 10' So. of hydrant #10 and 35' E. of E. edge of taxiway #1 at Sta. 21+56	98.351	T.B.M.	Kelly-(Profile)

Figure 14-4.-A bench mark sheet.

reduces the data to corresponding horizontal distances and elevations. This data serves as the basis from which the topographer does the plotting. The rodman must be trained to recognize and properly occupy the necessary control points.

LEVELING PARTY.— Two persons, a levelman and a rodman can run a line of differential levels; however, the use of two rodmen will speed things up. For direct readings, the instrumentman keeps the notes; for target readings (which are, as you know, read by the rodman), it is usually more feasible to have the rodman keep the notes.

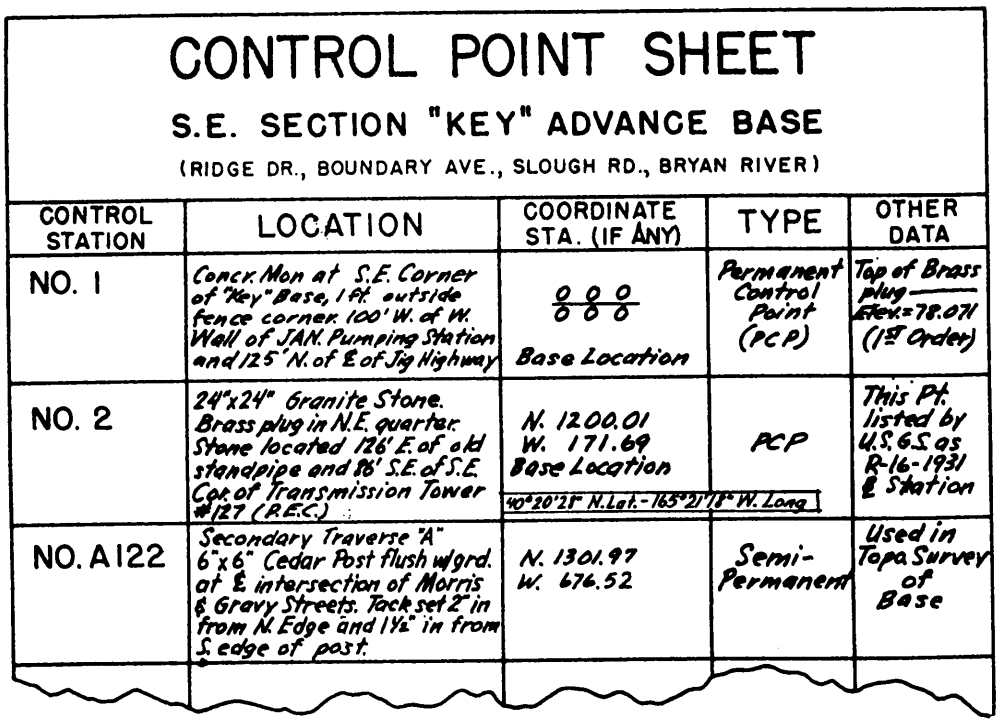
Work Assignments

When an order to proceed with certain work is received (usually from the engineering officer), the work (or part of it) is assigned to an available field party on a work assignment sheet. Figure 14-3 shows the type of information entered on a typical work assignment sheet.

Abstract Sheets

When field notes have been reduced to the data sought in the survey, this data is set down in an **abstract sheet.** Typical abstract sheets are **bench mark** sheets, **control point** sheets, **traverse** sheets, and **base line** sheets.

Part of a bench mark sheet is shown in figure 14-4. As you can see, the number, location, elevation and type of each bench mark in a designated area is given. A control point sheet is similar, except that it gives the horizontal locations of horizontal control points, as



CONTROL POINT SHEET

S.E. SECTION "KEY" ADVANCE BASE

(RIDGE DR., BOUNDARY AVE., SLOUGH RD., BRYAN RIVER)

CONTROL STATION	LOCATION	COORDINATE STA. (IF ANY)	TYPE	OTHER DATA
NO. 1	Concr. Mon at S.E. Corner of "Key" Base, 1 Ft. outside fence corner. 100' W. of W. Wall of JAN. Pumping Station and 125' N. of ℄ of Jig Highway	0 0 0 / 0 0 0 Base Location	Permanent Control Point (PCP)	Top of Brass plug —— Elev.=78.071 (1st Order)
NO. 2	24"x24" Granite Stone. Brass plug in N.E. quarter. Stone located 126' E. of old standpipe and 88' S.E. of S.E. Cor. of Transmission Tower #127 (P.E.C.)	N. 1200.01 W. 171.69 Base Location 40°20'21" N.Lat.-165°21'18" W. Long	PCP	This Pt. listed by U.S.G.S. as R-16-1931 ℄ Station
NO. A122	Secondary Traverse "A" 6"x6" Cedar Post flush w/grd. at ℄ intersection of Morris & Gravy Streets. Tack set 2" in from N. Edge and 1½" in from S. edge of post.	N. 1301.97 W. 676.52	Semi-Permanent	Used in Topo. Survey of Base

Figure 14-5.-A control point sheet.

shown in figure 14-5. Traverse and base line sheets give the locations of traverse or base line stations, the latitude and departure of each course or baseline, and the coordinate location of each traverse or base line station. For a traverse sheet or base line sheet, the computational sheet used to compute latitudes, departures, and coordinates usually provides a satisfactory abstract.

Procedures for Checking Field Notes

You are already familiar with field and office work and therefore realize the ever-present possibility of errors in surveying. As supervisor, you should be aware that a large part of your job is checking to ensure that errors are detected. In the field, as mentioned before, you must keep the measurement situation in hand by ensuring that the measuring methods used are those that reduce the possibility of error to a minimum. For example, when tape corrections are called for, you must ensure that correct tension is applied, that temperatures are taken, and that temperature corrections are applied accurately.

You are also responsible for error-free computations. Obviously, you cannot check all computations by performing all the calculations involved; this would be the equivalent of doing all the computing yourself. You can, however, require computing procedures that will, if they are followed, reveal the existence of errors. For example, you can require that areas be obtained both by double meridian distance and by double parallel distance. There are, of course, numerous other computations in which the use of two methods will give results that can be checked against each other.

Finally, you must develop skill in the weighing of results for the **probability** of error. This is a skill that cannot be taught; it comes with experience. For example, after you have had a good deal of experience with contour mapping, you develop the ability to get the "feel" of the ground when you study contour lines. This often helps you spot a misdrawn contour line arrangement because the arrangement is inconsistent with real-life probability.

Survey Crew Training

The techniques of the actual operation of surveying instruments are, for the most part, fairly easy to learn; and a crew member learns these quickly in the field. These techniques, however, are a small part of the knowledge involved in the art and/or science of surveying. If a field crew member is shown only how to set up and level an instrument, how to hold a rod, and the like, he is receiving only a minimal amount of training.

The best way to train crew members, in the other things they need to know, is to keep them constantly informed of the overall purpose of the job. Suppose, for example, that the crew is setting offset grade hubs for a highway. Tell them, as you go along, how these hubs will be used as guides for bringing the subgrade to the desired elevation and for placing the highway surface to the prescribed finished grade. Besides training the crew, you will be making fieldwork much more interesting for everybody-including yourself. Furthermore, a field crew will do a better job when they know the purpose of what they are doing.

Another incentive in producing highly motivated field crews is competition. Let's say you have a level circuit to accomplish. If time permits and if you are not far behind in your workload organize two or more level parties to run the same circuit. Then you can determine how proficient the crews are by seeing how closely each crew comes to the correct closing benchmark elevation and the time it takes each crew to run the circuit. You also can use this method in transit work for things like timing the setup of the instrument, measuring horizontal and vertical angles, and measuring distances by stadia. Always find time for training. Perhaps, when waiting for transportation to and from work you can start an open discussion of various solutions to an actual or hypothetical survey problem.

When you are training surveyors, do not forget that the EAs assigned to the drafting room or soils laboratory are also responsible for knowing the techniques of surveying. Whenever the work load permits, the engineering chief should rotate a few personnel for short, on-the-job training periods. This creates interest and helps your personnel to prepare for advancement.

Combat Intelligence Engineering Data

The collecting, analyzing, and reporting of engineering data for combat intelligence is the responsibility of the engineering division of an NMCB deployed to a combat area. Normally the collecting of such data is the job of the field survey crews or an EA assigned to a reconnaissance patrol.

"Combat intelligent" is defined as that knowledge of the enemy, weather, and geographical features (terrain) required by a commander in planning and conducting tactical operations. The objective of combat intelligence is to minimize the uncertainties of the effects that the enemy, weather, and terrain may have on the accomplishment of the mission.

Of primary interest to the EA is the collection of terrain data. Terrain information includes stream data (widths, depths, condition of banks, and rates of flow); bridge data (types, widths, lengths, conditions, and load limits); existing roads (types, widths, and conditions); and topographic mapping, including all pertinent natural and man-made features. In general, a rough reconnaissance survey is performed.

Methods for collecting engineering data will depend on the situation. You maybe given a military map and told to take a reconnaissance patrol out to check the accuracy of the map. Or, you maybe tasked with obtaining data for establishing a suitable construction site for an entire advanced base that might require the efforts of several crews. Your experience as a surveyor will enable you to collect data and report your findings to the engineering officer who, with your assistance, can analyze the data and make recommendations to the battalion planning team.

Information pertinent to organization and deployment of a reconnaissance patrol is found in the *Seabee Combat Handbook* NAVEDTRA 12003. The battalion operation order will specify combat intelligence procedures.

MATERIALS TESTING SECTION

Personnel assigned to the quality control (QC) division of the operations department are responsible for ensuring that construction work is according to the job specifications; that is, the workmanship, materials used, prevailing conditions, and appearance of the finished structure are within the specified minimum standards. This involves constant and careful construction inspection and materials testing. While QC is capable of performing inspections, it needs support from the materials testing section of the engineering division to perform testing, such as in-place density and concrete strength determinations.

As the EA supervisor, a large portion of your job is making sure that QC is receiving the support that it needs. This includes, in part, coordinating testing requirements to ensure that all tests are completed on time, making sure that tests are performed using established standard procedures, analyzing test results for accuracy and validity, and advising QC of the testing results. In addition to providing support to QC, the materials testing section also performs tests, such as soil classification and compaction testing, that may be needed for the design of a new structure, road, or

airfield, or the various tests that are associated with the design or proportioning of concrete or asphalt-concrete mixtures. Obviously, to do all of this testing, you must make sure that your EAs are properly trained. If you have been away from a construction battalion for some time, you may even find it necessary to do some refresher training yourself.

Work Assignments

As with the drafting and surveying section, requests for materials testing can be made using the engineering division work request (fig. 14-1). These can then be posted to a work schedule and handled using a priority-system method like that described previously.

Not all of the work requests, however, will be originated by a project supervisor or the QC division. Many of them should start with you. For this to happen, you must become thoroughly familiar with each of the projects the battalion is tasked with. This involves reviewing the project plans and specifications to see what tests are needed and reviewing all project schedules to know when the tests are required. Having done this, you can generate the work requests and post work to the schedule with tentative start dates that can be adjusted as changes occur. Obviously, you must coordinate closely with the project supervisors and QC to know when changes are needed.

Many of the materials tests are critical item tests that must be performed at a given point in construction before further construction work can proceed. For instance, asphalt paving operations on a road or parking area cannot start until the base material has been compacted to meet specifications. Current COM- SECONDNCB or COMTHIRDNCB and battalion instructions pertinent to quality control state minimum requirements and stress critical item inspections and tests that must be performed during construction. You should be particularly aware of these so that project work will not be delayed for materials testing.

You need to remember, too, that some tests are dependent upon other tests; for example, the results of in-place density testing using the nuclear moisture-density meter must be compared with the results of laboratory tests performed on the same material. For these pretests, you will not receive a work request; you must initiate them yourself. Never wait until the last minute to have these tests performed or you maybe the cause of unnecessary construction delay.

Analyzing Test Results

All materials tests have a specific purpose, and when carefully performed according to established standard procedures should provide results that can be reasonably expected. As a supervisor, you need to know what the end purpose is before you can decide what tests to perform and you need to know what to expect from the tests. With this knowledge, you are in a position that enables you to analyze the results of each test performed. When a test results in data that is greatly out of step with that expected, then you need to determine the cause; for example, if an in-place density test shows unexpectedly high results, what happened? Was the test performed improperly? Was a substance, such as cement, added to the soil that greatly increased the density of the in-place material as compared to previously performed laboratory tests? These things can, and do, sometimes happen.

In addition to analyzing the test results for accuracy and validity, you sometimes need to place the test data into a more usable form. Figure 14-6, for example, shows California bearing ratio data that is presented in a usable form. You can read about this in *Materials Testing,* NAVFAC MO-330.

Training of Testers

Lower rated personnel assigned as materials testers should be given assignments for spare-time reading of printed sources on testing procedures. Locally used data forms should be explained. New personnel should be assigned to learning on-the-job procedures in the laboratory and at the jobsite under experienced personnel. The purpose of what is being done should always be explained; for example, the ultimate effect of soil tests on the work of highway subgrading should be clearly shown. Some testing, such as fieldtests for soils, require extensive practice to become proficient. Even though field testing is a requirement at the senior EA level, you should see to it that the junior rated EAs get a chance to practice it as often as possible under the watchful eye of an experienced technician.

There is relatively little routine, day-to-day work in testing since the work of the materials testing

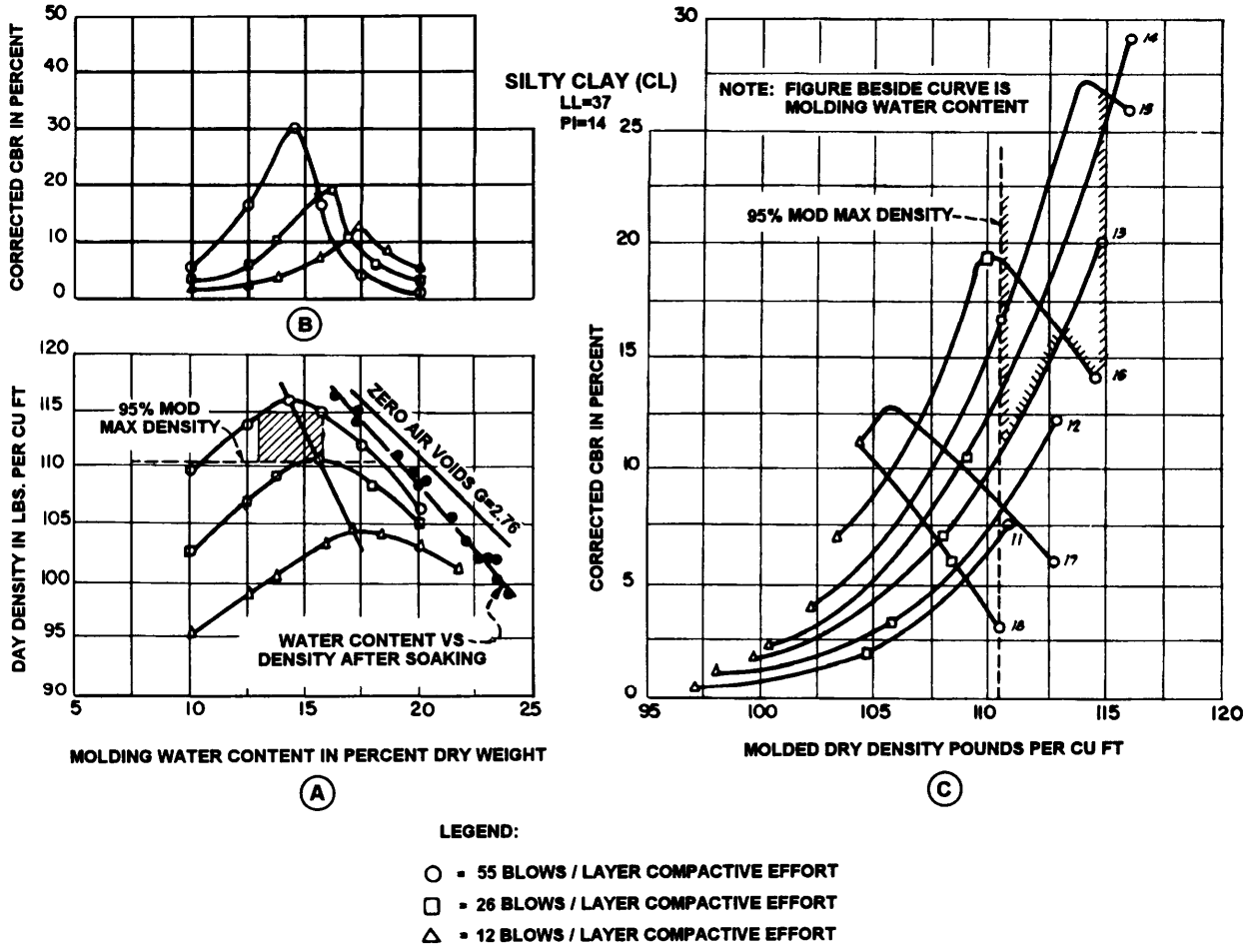


Figure 14-6.—Presentation of CBR data.

section is keyed to the construction currently being done. The person making soils tests in the laboratory today may be performing slump tests on the jobsite tomorrow. The testing section is usually small; and therefore, each person in the section must be trained to cope with all testing problems. In short, one of your main responsibilities as a supervisor is to train your people.

QUESTIONS

The following questions are strictly for your use in determining how well you understand the topics discussed in this chapter AND IN THE REFERENCES SPECIFICALLY CITED IN THIS CHAPTER. The intent of these questions is to help you to learn the topics contained in the chapter and in the references. Remember: when you participate in the advancement examination for EA1, you may be asked questions that are drawn not only from this TRAMAN but also from the cited references as well. Therefore, it is to your benefit to answer the review questions. You do NOT have to submit your answers to these review questions to anyone for grading. Similar review questions are included at the end of each chapter. After answering the questions, you may turn to appendix VI of this book to see how well you performed.

Q1. In the normal 55-hour battalion workweek your EAs have produced 600 man-hours of labor. How many man-days of labor does this equate to?

Q2. In general, the majority of the work that EAs perform while in a battalion should be considered as what type of labor?

Master Activity Description	MD Est.	Weighted Percent	Percent Complete (Work in place)	Percent Complete (Actual)
Move in and excavate	13	26	100	26
Prefab forms	4	?	100	?
Install forms	3	?	100	?
Place concrete	6	?	75	?
Rough electrical	8	?	75	?
Rough utilities	6	?	0	?
Finish electrical	3	?	0	?
Finish utilities and move out	7	?	0	?
Total	50			?

Figure 14-7.—Example end-of-month status for a project.

Q3. Figure 14-7 shows the end-of-month status for a Seabee project. For this project, what is the total percent of project completion that should be reported in the monthly SITREP? (You will need to determine the missing data)

Q4. A certain NCF project was originally estimated to require 600 man-days of direct labor. To date, 650 man-days have been expended and the project is 75-percent complete. Based on this information only, how many man-days of labor should be required to complete the remaining 25 percent of the project?

Q5. Assume that your battalion is deployed to Seabee Camp Shields, Okinawa. As part of your engineering tasking for the deployment, you are to prepare construction drawings for a future project to be sited at the camp. When completed to what command should the drawings be forwarded for final approval?

Q6. According to the TRAMAN, there are two reasons for you to have the ability to foresee all of the steps required to complete a job that you intend to assign to one of your EAs. What are those two reasons?